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ABSTRACT

To determine the impact of causal relationships and shared features in the use of analogy, subjects in two separate studies were informed of the behavior of six members of a little known primitive tribe and asked to make predictions on the behavior of additional tribe members based on their perceived similarities with the original group. Results indicated that people are more likely to use analogies when elements in the base (familiar item) and the target (unfamiliar item) appear to reflect a similar causal relationship. To discover whether or not people use analogy in the absence of any known causal relationship, subjects in a third study were asked to make predictions on behavior that was identified with only a nonsense word. Being unable to use any personal background knowledge in their predictions, subjects were forced to rely on global similarities between target and base items. Results demonstrated that in the absence of a known causal relationship, people will use a single shared characteristic between base and target as the basis for an analogy. (MM)

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The use of analogy in causal reasoning

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Careful observation of our day to day lives suggests that analogies to familiar people and situations play an important role in social reasoning. For instance many people have had the experience of responding to an acquaintance or colleague in the same way in which they typically respond to a parent or sibling. When they catch themselves doing this they often find that this individual reminds them in some way of the parent or sibling. Or consider the concept of transference in psychotherapy. It has long been noted that during therapy, clients often come to respond to the therapist as if he/she were an important other individual in the client's life.

Not only do we respond to people analogically, we also respond to situations by analogy. Haven't we all found ourselves saying things like, "Oh, this reminds me of the time we had that big fight with your father. Let's not go through that again!"

One area in which such analogical reasoning is particularly noticeable is in politics. For instance, much of the recent argument about U.S. involvement in El Salvador has revolved around whether and in what ways El Salvador is analogous to Vietnam. Clearly, the situation with El Salvador is not an isolated case. Both May(1973) and Jervis(1976) have shown that the available historical evidence demonstrates that political decision-makers often resort to analogy to previous situations in deciding what course of action to pursue.

Until recently, evidence for the use of analogy in social reasoning remained largely anecdotal. However, several recent papers provide experimental evidence for the use of analogy in social reasoning. For instance, in one study Thomas Gilovich(1981) showed that political science students' predictions for an hypothetical foreign policy crisis depended

upon whether superficial features of the crisis called to mind World War II or Vietnam.

A paper I have recently done (Read, 1983) also provides evidence for the use of analogies. In this series of studies I wanted some control over the outside knowledge my subjects brought with them. So I had subjects learn about a novel behavior in a novel setting. Specifically, subjects learned about the behaviors of six members of a primitive tribe in Northern Australia. Some of these members had performed a bizarre ritual while others had not. The ritual they had performed was to cut their finger with a knife and use the blood to draw symbols on a piece of bark. Here is an example of a description of an individual.

After learning about these members, subjects then predicted whether other members of the tribe would also perform the ritual. As expected, subjects were much more willing to predict that a member of the tribe would perform the ritual if that individual was similar to a single other individual who had been observed to perform the ritual. Thus, this study provides further evidence that people will use an analogy to predict behavior.

However, neither of these studies explicitly analyzed any of the components of analogy use. While it is possible to distinguish several different components, such as how a potential analogue is retrieved from memory or how potential analogies are represented in memory, in my talk today I am going to focus on one particular component, the nature of the mapping between the instance for which we wish to make a prediction and the potential comparison instance. In general terms we can think of the mapping between two items as the similarity and differences between the items or the degree of feature overlap between the two items.

In order to make it easier to talk about analogy, I am going to adopt

some terminology introduced by Gentner(in press). An analogy can be considered to have two parts, the target and the base. The target of the analogy is the person or situation for which a prediction is to be made, while the base is the person or situation from which knowledge is transferred so as to be able to make a prediction for the target. For instance, when people compare El Salvador to Vietnam, El Salvador is the target for which they wish to make a prediction, while Vietnam is the base from which they wish to transfer knowledge.

In examining the mapping process between the target and base, it is useful to follow Mary Hesse(1966) in distinguishing between two kinds of relations in analogies: horizontal relations and vertical relations. Horizontal relations are relations of similarity and difference between features of the base and features of the target. Vertical relations are the relations among the features of the base or among the features of the target. While there may be a number of different kinds of vertical relations, one of the most important to the use of an analogy is probably a causal relationship between features of the base and the behavior or outcome of the base. A number of people, going back at least to John Stuart Mill, have suggested that the presence of a causal relationship between features of the base is crucial to the use of analogy.

While it seems reasonable that the presence of a causal relationship is crucial to the use of an analogy, there has been no direct expeerimental test of this. The next study was designed to examine this point.

To do this, I again used my primitive tribe. Subjects learned about six members of the tribe. Some subjects learned about people who had cut their finger with a knife, while others learned about people who avoided the medicine man when they encountered him.

Once subjects finished studying the six members they then predicted whether several other members of the tribe would also perform the behavior. One of these members was similar to a member in the learning set who had performed the behavior.

The major variable of interest was whether this new individual matched a previous individual who had performed the behavior on a feature which could be causally related to performing the behavior. For instance, for those subjects who learned about members of the tribe who had avoided the medicine man, some might learn about an individual who had spent the day weaving and then later avoided the medicine man while others might learn about an individual who had violated a taboo and then later avoided the medicine man. My intuition, and I hope yours also, was that people would find it easier to figure out a plausible causal relationship between violating a taboo and avoiding the medicine man, than between weaving all day and avoiding the medicine man. Independent ratings indicated that this intuition was correct.

Anyway, when subjects made their predictions they were more likely to think that an individual would avoid the medicine man or cut their finger if that individual matched a previous instance on a causally relevant event, such as violating a taboo, then if the individual matched on a causally less relevant event such as spending the day weaving. Thus, the existence of a causal relationship does have an important effect on whether people will rely on analogies to single, previous events.

While it seems likely that the results of this study are due to the effect of the causal relationship on the mapping process, it is conceivable that the results may have occurred simply because people are more likely to retrieve potential bases with causally relevant features. That is, people might decide that because a particular feature might be causally

efficacious, it would be worthwhile to search for a previous instance which also possesses that feature. Thus, people might be more likely to use causal features as retrieval cues. This leaves open the possibility that the effect of causal relevance in this study might be due only to retrieval effects.

The next study was done to try to eliminate this possibility. This was done by using a greatly modified version of the original procedure, which eliminated the need for subjects to retrieve potential base instances from memory.

Subjects were given a questionnaire which asked them to imagine that they were an anthropologist studying a little known tribe and that they were trying to figure out how and why the members of the tribe behaved. Subjects then received a single example of a member of the tribe who had done something such as violate a taboo and later cut their finger with a knife. Immediately following this example, on the same sheet of paper, was an example of another individual who had also violated a taboo. Subjects were then asked to predict whether this new individual would or would not cut his/her finger. Different subjects received different behaviors to make predictions about. More important, I varied whether the target individual matched the potential base on a high causal relevance behavior or on a low causal relevance behavior.

The rationale for this procedure is that by placing the base and target individual on the same sheet of paper, immediately following one another, the need to retrieve the potential base from memory should be eliminated.

As expected, people were more likely to predict that the target individual would perform the behavior, when he/she matched a potential base

individual on a high causal relevance feature. This strongly suggests that the effect of causal relevance could not simply be a retrieval effect, but instead affects the mapping and application of an analogy.

While the previous two studies indicate that people are much more likely to use an analogy when the base and target share features which can be causally related to the outcome of the base, it is not clear that the existence of such a causal relationship is necessary. One question that arises is whether people are willing to use an analogy in the absence of any known causal relationship. That is, in making a prediction for a target will people be willing to rely on the global similarity between the target and the base. It seemed to me that people might be willing to rely on such global similarity.

This last study examined this issue. However, in order to do so I had to totally eliminate the possibility that people would apply outside knowledge to the stimuli. In the previous studies, it was possible to use general knowledge about things such as guilt and penance to come up with plausible hypotheses about possible causal relationships. In order to eliminate even this contribution of outside knowledge subjects once again learned about a member of a primitive tribe, but this time subjects learned about individuals who had performed a behavior which was identified only by a nonsense word. For instance, one subject might read that an individual had spent the day weaving and then had tewoled. Another individual might have spent the day herding goats and then bilasimed. As I hope you will agree, it would have been extremely difficult, if not impossible, for subjects to arrive at a causal relationship between weaving and tewol, or herding goats and bilasim. Thus, with these stimuli, to the extent that individuals based their predictions on a single, previous instance they could not be relying on any causal relationship, but would instead be

relying on overall similarity.

The study was set up as follows: As in the previous study, subjects were told to imagine that they were an anthropologist studying a little known tribe in Northern Australia, and that they had become interested in one particular behavior(such as tewol or bilasim). In addition, subjects were told that only 20% of the tribe seemed to perform this behavior. Information about the base-rate was given for two reasons. First, it provides some idea of what the "correct" response should be in the absence of any other information. Second, to the extent that an analogy affected people's predictions it would give us a better idea of the strength of the analogy, than would the situation with no base-rate.

Immediately following the base-rate information subjects were then presented with an example of an individual who had performed the behavior. Immediately following this was a description of a new individual. Subjects were asked to give the probability that this new individual would perform the behavior. The degree of feature overlap between the base and target was varied from no feature overlap to 1 feature overlap to 6 feature overlap. The degree of feature overlap was manipulated by varying the length of the description of the base and target individual, since the base and target in a condition always had the same features. Thus, in the no feature overlap condition, no attributes other than a name were listed for either base or target. In the 1 feature overlap condition, one similar feature was listed for both base and target. And in the six feature overlap condition six features were listed for both base and target.

In addition, a set of control groups were run in which subjects were not given an example of someone who had performed the behavior. In these groups subjects were given either the no feature description, the 1 feature

description or the 6 feature description and asked to predict whether the individual would perform the behavior. This controls for the possibility that subjects' predictions might simply be a result of the length of the description.

If subjects are willing to rely on global similarity in making a decision then we would expect that with greater feature overlap subjects would predict that the target was more likely to perform the behavior. This is precisely what happened(See Table 1). Interestingly, the increase in probability from one feature overlap to six feature overlap was about the same as the increase from no feature overlap to one feature overlap. This suggests that with increasing degree of overlap each feature makes a smaller contribution to the perceived probability that the target will perform the behavior. Note also that in the control groups where a similar previous individual was not available, the number of features had no significant effect on people's predictions.

One thing that makes this study particularly interesting is that subjects were explicitly given base-rate information about the frequency of the behavior in the tribe. Even with that base-rate information, it only took similarity on one feature to significantly effect people's predictions.

Actually, even in the present study, subjects' willingness to rely on global similarity might be based on the assumption that there is some causal relationship between features of the base and its behavior. After all, in the absence of other information, one example of the co-occurrence of a set of features with a given outcome provides at least some evidence that some of these features may be causally related to the outcome. So that while in this study there is no information about what the <u>nature</u> of the causal relationship is, the co-occurrence of features and outcome

provides tentative evidence that a causal relationship may exist.

The studies I have outlined today clearly demonstrate that when people are asked to predict an outcome they will often resort to an analogy to a single, concrete instance in doing so. Further, they are more likely to resort to such an analogy, if the base and target share a feature or features which can be causally related to the outcome or behavior of the base. However, the last study also demonstrates that even in the absence of a known causal relationship, people will still rely on an analogy to a single, previous instance.

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Table 1: Probability of Behavior

		Degree of Feature Overlap		
		0 Feature	1 Feature	6 Feature
No Match	M	29.7	36.1	36.8
	N	18	18	20
Match	M	32.1	48.4	68.2
	N	19	19	20